OBJECTIVES

Upon completion of this module, without reference material, the trainee will be able to:

1. List the two methods for verifying net weight compliance.
2. Give an example of when a net weight check for compliance would be exempt.
3. Select the correct definition for the following terms:
   - Standard weight package
   - Random weight package
   - Labeled weight
   - Net weight
   - Tare weight
   - Average tare weight
   - Package error
   - Production lot
   - Inspection lot
   - Sample
   - Maximum allowable variation (MAV)
   - Sample unit
   - Decision criteria
   - Total package error
4. List five acceptance criteria for scales that are used to determine net weight compliance.
5. Select the conditions that require the FSIS program employee to record the lower scale graduation on a mechanical net weight testing scale.
6. Select the conditions that require the FSIS program employee to record the next higher scale graduation when a mechanical scale is used for a net weight test.
7. Describe the action that must be taken by the FSIS program employee when a scale is found to be inaccurate.
8. Given a list of products, determine if they are homogeneous or nonhomogeneous.
9. Given a list of products and their weights, select the correct group for each product from Table 2-12 of FSIS Directive 7240.1.

10. Given individual tare weights, determine the average tare weight.
11. Given the size of an inspection lot, select the correct sampling plan.
12. Determine the number of packages or containers that must be drawn from the inspection lot for net weight testing and tare weight determination.
13. List two requirements or criteria that net weight test results must meet for the inspection lot to be in compliance.
14. Given Table 2-12 of FSIS Directive 7240.1 and a description of the product, calculate the Maximum Allowable Variation (MAV) for package weights designated for inspection.
15. Determine individual package errors and properly record them on the FSIS Form 7240-1.
16. Given a set of sample net weights for groups 1 through 5 of standard and random (catch) weight products:
    a. Calculate the maximum allowable variation (MAV).
    b. Determine the + or - package error.
    c. Calculate the total package error.
    d. Apply the pass/fail decision criteria.
    e. Record net weight test results correctly on FSIS Form 7240-1.

SCRIPT

Introduction

Net weight is defined as the weight of packaged product remaining after deductions for tare weight have been made. *Tare weight,* defined as the weight of the container, box, wrapper, or other packaging material, is always excluded when determining the actual net weight of meat and poultry product.

Labeled weight, defined as the net weight declared on the label or on the outside of the package, must be an accurate declaration of the net weight of all the nutritious content in the package that is suitable for food. For a pork and barbecue sauce product, the net weight would be the weight of the entire contents of the package or container, excluding the weight of the package/packaging material. On the other hand, when meat or poultry products are package in a nonnutritious media, such as water or brine the net weight would actually be the *drained weight* or only the weight of the solids in the package. For pickled pigs feet packed in vinegar, the net weight is the drained weight. When products such as pickled pigs feet are packed in a nonnutritious media that is customarily discarded by the consumer, not only is the packaging material considered part of the tare but also the media, e.g., water, brine.

Meat and poultry establishments are responsible for assuring that the net weight statement "as it is shown on a label shall not be false or misleading and shall express an accurate statement of the quantity of contents of the container." In the ideal sense, to be "accurate" is to provide an "exact" quantity of contents declaration on the label. Since total accuracy is virtually impossible to economically enforce, such a requirement would be impractical. Hence, FSIS net weight regulations allow "*reasonable" variations* from the labeled weight. Checking package or container weights for reasonable variations and compliance during production is strictly the establishment's responsibility.

The net weight of a package may change prior to being shipped from the establishment as a result of storage times and temperatures. For example, packages held in storage for a longer than normal period of time may lose a significant amount of moisture, which may lower the package net weight enough that it is no longer acceptable. Therefore, establishments *should* perform net weight checks to verify compliance when products are staged for shipping.

The establishment is required to identify its production. Commonly, this is done by lotting. A *production lot* is a total collection of packages or containers coded identically, consisting of those packages or containers produced within a given period of time. There is no specific standard on the size of a production lot. A packer may define a production lot as two hours of production, half a shift's production, or an entire shift's production. The only requirement that FSIS inspection has is that the production lot be realistic in size, properly identified, and acceptable to the IIC.

FSIS program employees are responsible for verifying that meat and poultry products that carry a net weight statement are in compliance with regulatory requirements, unless product net weight has been verified by another government agency, such as the USDA Grading Service. Verification of compliance may be accomplished by one of two methods: lot *inspection tests or on-line weight tests* when an establishment has a quality control program or system.

For lot inspection, FSIS program employees select samples, record results, and take appropriate action based upon their findings.

When an establishment is using a quality control program or system to verify net weight compliance, establishment personnel take samples, record results, and take the actions necessary to assure effective control of product net weight. FSIS program employees verify the program or system by evaluating establishment records and performing net weight verification inspections, which include sampling.

Lot Inspection Overview

FSIS uses net weight compliance procedures contained in the National Institute of Standards and Technology (NIST) Handbook 133, "Checking the Net Contents of Packaged Goods," and the requirements for scales contained in NIST Handbook 44, "Specifications, Tolerances, and Other Requirements for Weighing and Measuring Devices." FSIS and Federal and State regulatory agencies adopted these compliance procedures in 1992 so that, on a national basis, meat and poultry products would be subject to standard net weight test methods generally uniform with those used for other food products. FSIS has developed a Net Weight Field Manual (Attachment 3 of FSIS Directive 7240.1) that extracts those parts of NIST Handbook 133 intended for use by FSIS program employees in meat and poultry establishments. The Net Weight Field Manual is designed for use in the official establishment for *lot inspection only.*

Lot inspection net weight compliance testing procedures include:

- Defining the inspection lot.
- Sampling from the inspection lot.
- Performing net weight tests on the sample packages.
- Determining compliance of the inspection lot by comparing net weight test results with requirements (decision criteria.)

Under lot inspection, the FSIS program employee is required to define the inspection lot and *notify* establishment management of what product is considered the inspection lot. The inspection lot as a whole either passes or fails as a result of net weight testing. Every package or container in the inspection lot is subject to the same final disposition, regardless of its own compliance or lack of compliance.

What is an inspection lot? An *inspection lot* is a collection of identically labeled packages or containers (except for the actual net weight in the case of random weight packages) from the same production shift available for testing at one time.

It may be one hour's production, half a shift's production, or an entire shift's production. Since the inspection lot is dependent upon the amount of production available at the time the FSIS program employee conducts a net weight test, it may or may not be the same as the production lot. In many instances, only a portion of a packer's production lot is defined as the inspection lot. In no case can the inspection lot be more than the production lot.

At the same time the FSIS program employee defines the inspection lot, he/she must decide if the lot consists of standard or random (catch) weight packages or containers.

If they are *standard weight,* every package or container is produced to contain a predetermined, "standardized" amount of product and will have identical net weight declarations. When packers produce standard weight packages or containers, they target the average fill of these packages or containers to

equal or exceed the predetermined weight declared on the label. *Random weight packages,* on the other hand, contain varying amounts of product and will not have identical net weight declarations. When packers produce random weight packages or containers, they usually fill unmarked (no net content statement) empty packages or containers, weigh them, and then mark the net contents on the package or container label.

After the FSIS program employee has defined the inspection lot, the next step is to determine the number of individual packages or containers included in the inspection lot. At times, an inspection lot may contain a large number of packages that are packed in cartons (shipping containers), with every carton containing the same number of packages. These cartons may, in turn, be stacked in equal numbers on pallets. In such situations, the FSIS program employee need only count the number of cartons, then multiply by the number of packages per carton to determine the lot size. If the inspection lot includes a large number of packages or containers an estimate of the lot size, accurate to within 5% of the total, is sufficient. The exact count or accurate estimate of the number of individual packages or containers included in the inspection lot must be known in order to select the correct sampling plan in Table 2-5 of the Net Weight Field Manual. The *sampling plan* specifies the number of packages or containers (sample units) that must be drawn from the inspection lot for net weight testing, and the number of packages or containers required for tare weight determination.

With the amount of meat and/or poultry produced annually, it is not economically feasible to weigh each package or container for net weight compliance. Therefore, instead of using 100% testing, FSIS uses a statistical sampling procedure. Statistically based sampling plans require that only small portions, or samples, of the total packages or containers be tested. They allow FSIS to effectively and efficiently enforce the net weight regulation, provided that the portion tested is selected properly and the sampling plan is adhered to strictly. As with other FSIS statistical procedures, a *random method* must be employed to select the total number of packages or containers to be weighed. This is done in order to avoid any conscious or unconscious action that might influence which packages or containers are selected.

At this point, the FSIS program employee is ready to draw the sample, that is, to randomly select from the inspection lot the number of packages or containers prescribed by the sampling plan. In addition, he/she must randomly collect a tare sample for determining the average tare weight. The number of packages or sets of packaging materials required to be weighed for calculating an average tare weight is specified in Table 2-5 of the Net Weight Field Manual.

When the sample has been drawn, the FSIS program employee is ready to weigh each package or container. Any difference between the labeled net weight and the actual net weight is considered a *package error.* If the package or container contains *more* product than declared in the net weight statement, a *plus* error exists. On the other hand, if there is *less* product than declared, a *minus* error exists.

Once the FSIS program employee calculates the total package (sample) error by adding all the individual package errors, he/she must determine whether or not the lot is in compliance. In determining compliance, two items must be considered: individual package error and total package error. No *individual* package or container in the sample may be underweight by more than the maximum allowable variation (MAV). MAVs are based on the lower limits of a product group. Lower limits have been determined by process capability studies and are found in Table 2-12 of the Net Weight Field Manual. For total sample compliance, the sum

of the individual package errors or *total package error* must be equal to or exceed zero. Therefore, while an individual package or container in the sample may contain less product than declared on the label, the total product weight of all the packages or containers in the sample must *equal or exceed* the total labeled weight of all the packages or containers.

Lot inspection for net weight compliance is no different from other statistical procedures in that not all production lots will be inspected. The FSIS program employee will conduct net weight checks as scheduled through the Performance Based Inspection System (PBIS) or anytime he/she suspects that violative product is being produced by the official establishment.

SUPPLEMENT 1

Part I	Scales
Part II	Homogeneous Products and Product Groups
Part III	Tare Weights
Part IV	Sampling Plans and Decision Criteria
Part V	Package Errors and Recording Package Errors
Part VI	Applying the Decision Criteria-Maximum Allowable Variation and Total Package Error
Part VII	Net Weight Worksheet Examples for Evaluating the Net Weight Test for Compliance
Part VIII	Net Weight Workshop Problems

Resources

Meat and Poultry Inspection Regulations
Net Weight Module Introduction and Lot Inspection Overview
FSIS Directive 7240.1

PART I: SCALES

Requirements and Certification

All scales used to determine the net weight of retail, wholesale, or institutional packages of meat and/or poultry in official establishments must be installed, maintained, and operated to ensure accurate weights. Furthermore, such scales shall meet the applicable requirements contained in NIST Handbook 44.

Each scale must be tested, as specified in NIST Handbook 44, by a State or local government weights and measures official or a scale repair firm or person registered or licensed by a State weights and measures agency, and certified as accurate at least once during the calendar year. The operator of the establishment should display a valid certification on or near each scale that is used by the establishment to weigh meat or poultry products. Whenever the operator of the establishment cannot provide evidence that the scale has been certified as accurate, the FSIS program employee is to document the noncompliance on a noncompliance record (NR). The economic trend indicator is marked.

Before the FSIS program employee weighs packages or containers, he/she must ensure that the scale for the net weight test is of sufficient size and capacity to weigh the entire package or container, is level, is solidly supported, and has been adjusted by establishment personnel to read zero. Whenever an FSIS program employee finds a scale used to weigh meat and poultry products sold or otherwise distributed in commerce to be inaccurate, he/she should apply a U.S. Reject tag to it until the scale is repaired or removed from the official establishment. Then the FSIS program employee will document the fact that the scale is inaccurate on the NR and mark the economic trend indicator.

Mechanical Scales

Although many official establishments have switched to electronic scales for package or container net weight checking, some still use large and small capacity equal-arm (over/under) scales. This type scale (shown in Figure 1) is specifically designed for package testing. These scales typically have a center tower with two scale faces, one on each side of the tower, as depicted in Figure 2.

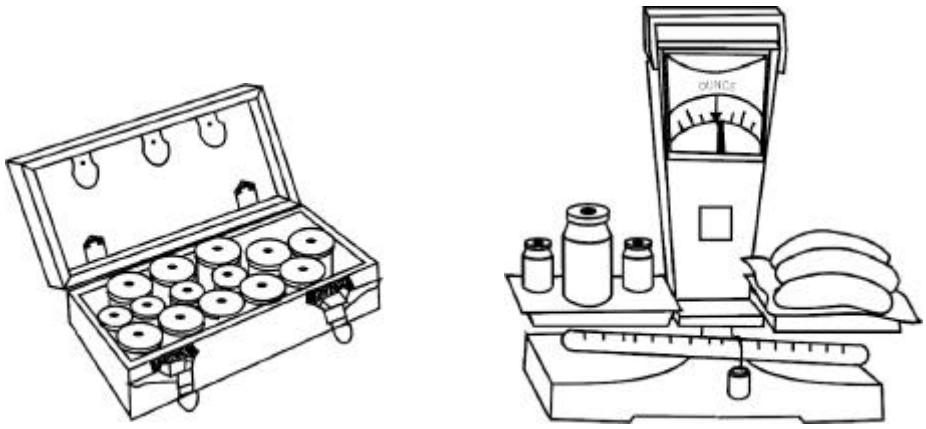


Figure 1. Test Weight Kit and Equal-Arm (Over/Under) Scale

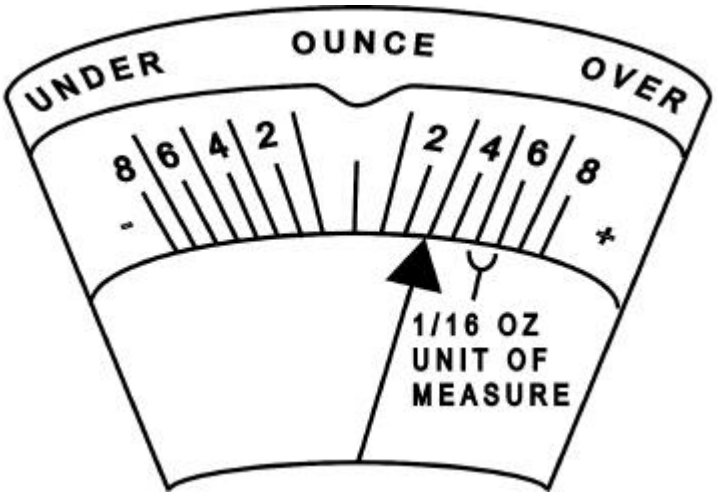


Figure 2. Package Testing Scale Tower Face

Generally, the more sensitive the equal-arm scale, the more beneficial it is to the producer. When reading a scale, one must stay within the unit of measure. The *unit of measure* is the smallest graduation on an equal-arm (over/under) scale. Therefore, the scale cannot be read to 1/8 oz when it is calibrated in 1/4 oz graduations. The unit of measure is a useful value because it allows the FSIS program employee to record readings from the scale without regard to the weight value that the reading represents. Any scale reading can be read as a whole number referred to as a "dimensionless unit" because the value does not have any dimension of pounds, ounces, grams, etc. To get a whole number of dimensionless unit, the weight value is divided by the unit of measure.

Example:

The pointer on the scale face of the equal-arm (over/under) mechanical scale shown in Figure 2 reads +3/16 oz. The unit of measure is 1/16 oz. Therefore, the calculation is:

$$\frac{+3/16 \text{ oz}}{1/16 \text{ oz}} = +3 \text{ dimensionless units}$$

Scale Reading

The following “reading rules” are to be applied when the weight indicator is not centered on a scale graduation. The FSIS program employee should read the weight value shown on the face of a mechanical scale to the nearest graduation when the weight indicator falls between two graduations.
For example:

- When the indicator is less than 1/2 the distance between two scale graduations, the value corresponding to the **lower** graduation is recorded. This concept is applied for both tare weight and gross weight determinations.

- When the indicator is more than 1/2 the distance between two scale graduations, the value corresponding to the **higher** graduation is recorded. This concept is applied for both tare weight and gross weight determinations.

- When the scale indicator is *exactly* 1/2 the distance between two scale graduations:
  - The value corresponding to the **higher** graduation is recorded when determining **gross** package weight.
  - The value corresponding to the **lower** graduation is recorded when determining **tare** weight.

Electronic Scales

In most instances, electronic scales can determine weight to a much finer resolution than they display. A scale that indicates weight to 0.01 gram determines weight internally to the nearest 0.001 or 1/1000 of a graduation. Electronic scales round values to the nearest indicated graduation. The smallest denomination of the digital display shown in Figure 3 is hundredths-of-a-gram, thus the unit of measure for this scale is 0.01 gram. Since the unit of measure for the electronic scale shown in Figure 3 is .01 gram and the scale reading is -0.08 gram, the calculation is:

$$\frac{-0.08 \text{ gram (indicated)}}{0.01 \text{ gram (scale graduation)}} = -8 \text{ dimensionless units}$$

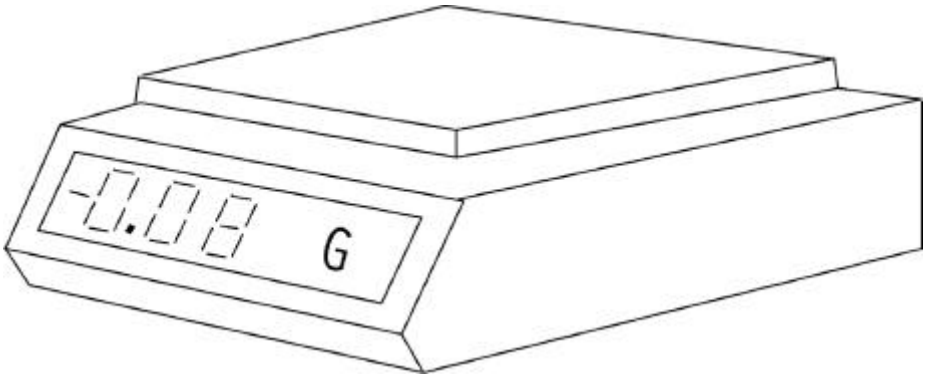


Figure 3. Reading the Unit of Measure on a Digital Scale

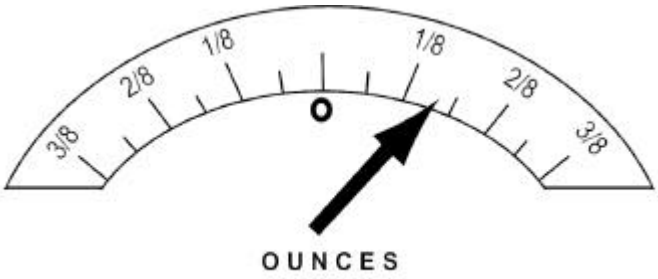
Reading Mechanical Scales Workshop

On pages 11 and 12 are problems related to the reading of mechanical scales. The first answer on each page is given as an example. Record the weight that should be read for the remaining three problems.

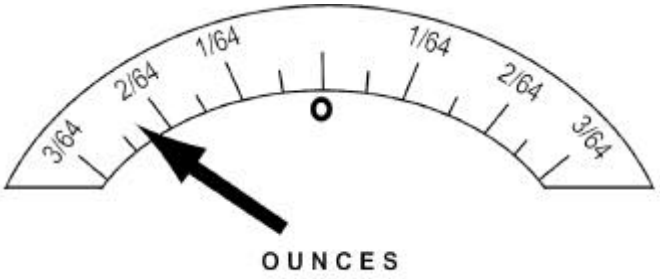
(**NOTE: THE MARK BETWEEN SCALE GRADUATIONS REPRESENTS THE HALFWAY POINT.)**

Packaging Materials:
(Tare Weight)

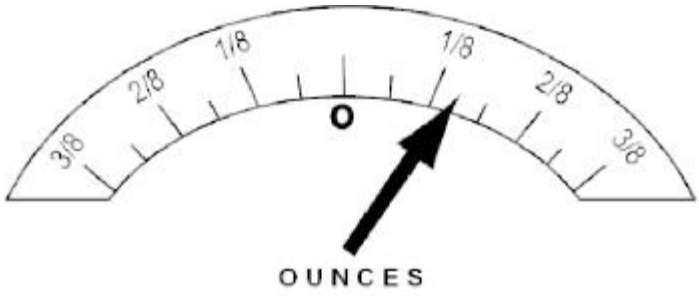
+ ¼ oz

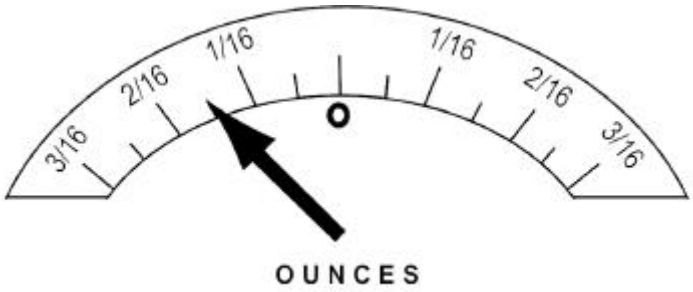


Gross Package Weights:



- 2/64





II. HOMOGENEOUS PRODUCT AND PRODUCT GROUP

For the purpose of assigning the lower limit for individual weights or the maximum allowable variation, all products are placed into one of the groups shown in Table 2-12 of FSIS Directive 7240.1 (see page 22).

Before placing a product into a specific group, determine:

- The labeled weight.
  - Find the net weight declared on the label or outside of the package.
- Whether or not the product is a homogeneous fluid when filled.
  - Homogeneous products are those that are of uniform consistency throughout. Strained baby food is homogeneous; beef stew is not. "Fluid" at time of filling usually refers to liquids, but some solid products, like shortening, are heated and considered fluid at the time of fill.

Work the following problems

From the following list of products, select homogeneous or other product by placing an "X" in the appropriate column.

	Homogeneous fluid When filled	**All other product**
Lard		
Franks		
Strained baby food		
Bacon		
Chicken Gravy		
Chicken Parts		

Now consider that you have an idea of what products are considered a homogenous fluid when filled, use Table 2-12 (page 22) to determine the group for each of the following products:

	Labeled Weight	**Group**
Bacon.....	**16 oz**	_____
Beef stew.....	**12 oz**	_____
Bologna.....	**6 oz**	_____
Lard.....	**16 oz**	_____
Chicken gravy.....	**6 oz**	_____
Canned Ham.....	**64 oz (4 lb)**	_____

III. TARE WEIGHTS

In net weight compliance testing of packaged meat and/or poultry, FSIS utilizes nondestructive tests insofar as possible and opens the fewest packages or containers needed for adequate testing. The net weight of a package or container may be determined by subtracting the average weight of the packaging materials (or the "average tare weight") from the weight of the unopened package/container (or the "gross weight"). Therefore, the average tare weight must be known before the net weight can be determined.

For most meat and/or poultry products, FSIS applies what is known as unused or dry tare. Unused tare is the weight of all packaging or container materials, e.g., soaker pads, containers, labels, bags, interior wrapping, that are not part of the product. Unused tare is weighed before the product is introduced into the container and should always be available at the establishment.

For those products packed in a media, which is customarily discarded by the consumer, FSIS applies what is known as wet used tare. "Used tare" defines all packaging material that can be separated from the packaged product, i.e., drained-away. It is referred to as "wet tare" when no effort is made to dry the absorbent portion of the tare or consume the liquid with the product. For corned beef packed in brine, the bag and label are "unused tare". The brine is not consumed, therefore, it is "used tare". Wet used tare is the weight of the brine, bag, and label. For this product, and others like it, a tare sample is not needed because all the packages or containers in the net weight test will be opened and a wet tare weight for each package or container will be determined (see Appendix 4 of FSIS Directive 7240.1).

To determine an average unused tare weight:

1. Use Table 2-5 in FSIS Directive 7240.1 (page 21) to determine tare sample size.

2. Observe the packages or containers to be tested and determine what components make up the packaging material.

3. Randomly select complete tare samples from the packaging materials in the establishment.

4. Weigh each package or set of packaging materials in the tare sample.

5. Add the weights together.

6. To obtain the average tare weight, divide the total tare weight by the number of packages or sets of packaging material in the tare sample.

7. If necessary, round the value obtained in step 6. The rounding rule in all average tare weight determinations is to *round the average value **up*** to the next scale graduation.

Sample problems for calculating average tare weight.

Example 1: Scale graduation = 0.01 lb

Tare 1 0.16 lb
Tare 2 0.17 lb
0.33 lb

0.33/2 = 0.165; rounded tare = 0.17 lb

Example 2: Scale graduation = 0.05 lb

Tare 1 0.05 lb
Tare 2 0.10 lb
0.15 lb

0.15/2 = 0.075; rounded tare = 0.10

Example 3: Scale graduation = 1/16 oz

Tare 1 4/16 oz
Tare 2 5/16 oz
9/16 oz

9/2 = 4.5/16; rounded tare = 5/16 oz

Because electronic scales round weights to the nearest indicated graduation, very lightweight packaging material may not register on the scale. When individual tare packages or sets of packaging material are too light to register on the scale, use one scale graduation for the tare weight.

Example: A scale weighs in 0.01 lb graduations. Two sets of tare do not cause the scale to register. Use the value of 0.01 lb as the tare weight.

Unless the individual tare weights vary excessively, the tare sample will be 2 packages/containers or sets of packaging material. Tare weight can vary considerably from package to package even for packages in the same production lot, although this is not the situation for most packaged products. It is a major problem with glass containers; therefore, the "alternate tare determination" procedure in FSIS Directive 7240.1 must be used when determining the average tare weight of glass containers.

Work the following problems.

	Tare Weights	Scale Graduation	Average Tare Weight	Rounded Tare Value
1.	0.14 lb 0.17 lb	0.01 lb	_____	_____
2.	5/32 oz 8/32 oz	1/32 oz	_____	_____
3.	0.20 lb 0.25 lb	0.05 lb	_____	_____
4.	5.06 g 5.15 g	0.01 g	_____	_____

PART IV: SAMPLING PLANS AND DECISION CRITERIA

Sampling Plans

Sampling plans state the number of packages (sample units) to be selected for net weight checks, the number of units in the tare sample, and the decision criteria.

Sampling plans are tabulated according to the size of the inspection lot and are given in Table 2-5 of FSIS Directive 7240.1 (page 21).

Decision Criteria

Decision criteria are the rules for determining whether or not an inspection lot complies with net weight requirements.

1. *Individual Package Requirement.* The limits of individual package or container variations are called *maximum allowable variations* (MAVs). A *MAV* is the maximum amount that the net weight of an individual package or container may be under its labeled weight or the largest minus package error that is considered to be "reasonable" in good manufacturing processes. The lower limits to help calculate the MAVs for meat and/or poultry product packages or containers are given in Table 2-12 of FSIS Directive 7240.1 (page 22).

    - When random (catch) weight packages are inspected for net weight compliance, more than one MAV may apply to an inspection lot if the weight range of the packages extends into more than one group in Table 2-12. Likewise, several MAVs may apply to an inspection lot of random weight packages when net weight declarations fall into Group 5 of Table 2-12. In these situations, do not calculate the MAVs until all of the packages in the sample have been weighed. After all the sample packages are weighed:

        - Calculate the MAV for the package with the lightest declared net weight in the sample (for purposes of this module call this the preliminary MAV);

        - Determine whether or not any minus package error is greater than the preliminary MAV;

        - Calculate the MAV for any package with an error greater than the preliminary MAV; and

        - Apply the decision criterion as appropriate.

    - Because random weight packages or containers are individually weighed and then marked with the net weight, the MAVs are usually greater than the package errors.

2. *Total Package Error Requirement (Average Requirement)*. The sum of the individual package errors comprising the sample or total error must equal or exceed zero.

Sample problem for determining sample size, tare sample size, and decision criteria

The FSIS program employee has defined the inspection lot as 2400 16-oz packages of bacon (code A052A). In Table 2-5 (page 21), if we read the sampling plan from left to right for an inspection lot of 251 or more packages, we can determine the following:

Sample size.....30

Tare sample size.....2

Number of minus package errors that
are allowed to be greater than the MAV.....0

Sum of individual package errors must be.....0 or positive number

Sample problem for finding the maximum allowable variation (MAV)

The FSIS program employee intends to use a scale calibrated in 1/16 oz graduations to weigh the 30 16-oz packages of bacon that will be randomly selected from the inspection lot of 2400 packages.

For the purpose of calculating MAVs, we must determine whether or not the product is homogeneous and which group the product is in using Table 2-12 (22). This was covered in Part II of the supplement.

Bacon is not in a fluid when packed; thus it is categorized as "all other product" Using Table 2-12, we find that this is a Group 3 product and the lower limit is 1 oz. MAVs are determined by converting the weight value given in Table 2-12 to a whole number or "dimensionless unit". If you divide the weight value from Table 2-12 by the unit of measure of the scale used to conduct the net weight inspection, you get a dimensionless unit. Therefore, the MAV value that is recorded and compared to individual package errors in this sample problem would be -16, since 1 oz is equal to 16/16 oz.

Formula : Lower limit ÷ Scale division = MAV

Calculation: $\frac{-16/16}{1/16}$ = -16 dimensionless units

NOTE: If a calculated MAV is a whole number plus some fraction, e.g., -1.5 or 1 1/2, the fraction is ignored or dropped and the MAV is -1.

If a MAV calculates to a value less than one, e.g., -0.62, the fraction is ignored or dropped and the MAV is 0. In this situation, there is zero tolerance for net weights lower than the labeled weight.

Remember: The MAV is a dimensionless, whole, negative number.

The Net Weight Worksheet

The sample size (from Table 2-5) and MAV (calculated from the lower limit taken from Table 2-12) and other information from the sample bacon problem can be recorded on the top portion of FSIS Form 7240-1. Completion of FSIS Form 7240-1, referred to as the net weight worksheet, is optional. In the remaining parts of this supplement, FSIS Form 7240-1 will be used as a worksheet.

NET WEIGHT WORKSHEET

Date	Establishment NO	Scale Division	Average Tare WT	Group NO	MAV (Lower Limit)
	00038--M	**1/16 oz**		**3**	**-16**
Lot Size	Sample Size	Product and Container Code:			Labeled Weight
2400	**30**	**Bacon AO52A**			**16 oz**

Work the following problems.

Instructions: Use Table 2-5 and Table 2-12 (pages 21 and 22) to determine the sample size, tare sample size, decision criteria, and calculate the MAV for the inspection lots described below. Record all applicable information on the top of FSIS Form 7240-1.

Problem #1

The FSIS program employee assigned to Est. 38 determines that the inspection lot consists of 230 cases of beef burritos (code C122B). Each case contains a dozen 8-oz (227 g) **individually** labeled burritos. The scale he/she will use to conduct the net weight check has 0.1 g calibrations.

Tare Sample Size_____ # of package errors > MAV _____ Sum for individual package errors _____

NET WEIGHT WORKSHEET

Date	Establishment NO	Scale Division	Average Tare WT	Group NO	MAV (Lower Limit)
Lot Size	Sample Size	Product and Container Code:			Labeled Weight

Problem #2

The FSIS program employee assigned to Est. P-42 determines that the inspection lot consists of 175 boxes of young chicken thigh meat (Pack Date: 1-3-96). Each box weighs 50 lb. The scale he/she will use to conduct the net weight check has 0.01 lb calibrations.

Tare Sample Size_____ # of package errors > MAV _____ Sum for individual package errors _____

NET WEIGHT WORKSHEET

Date	Establishment NO	Scale Division	Average Tare WT	Group NO	MAV (Lower Limit)
Lot Size	**Sample Size**	**Product and Container Code:**			**Labeled Weight**

TABLE 2-5. SAMPLING PLANS OF CATEGORY B

1	2	3	4	5
Lot size (number of packages in lot)	Sample size (number of packages in sample)	Tare sample size* (minimum number of packages chosen for average tare weight)	Number of minus package errors allowed to exceed the MAV	The sum of the individual package errors must equal zero or be a positive number
Up to and including 250	10	2	0	
251 and greater	30	2	0	

* A special rule for tare sampling applies for glass containers. See Appendix for Alternative Tare Procedure.

TABLE 2-12. U.S. DEPARTMENT OF AGRICULTURE, MEAT AND POULTRY, GROUPS AND LOWER LIMITS FOR INDIVIDUAL PACKAGES

Group	Definition of Group		(MAV) This is the Lower Limit for Individual Weights (Use the limits according to the scale division being used)	Recommended Maximum Scale Division Size for Checking Package Weights
	Homogenous, Fluid when Filled	All Other Products		
A	less than 3 oz or 0.1875 lb	less than 3 oz or 0.1875 lb	10% of labeled weight	1 g or 0.001 lb*
1	3 oz - 16 oz 0.1875 lb to 1.0 lb		7.1 g 0.016 lb 0.25 oz 8/32 oz 4/16 oz 2/10 oz 2/8 oz 1/4 oz	0.002 lb*
2	over 16 oz	3 oz - 7 oz 0.1875lb - 0.4374 lb	14.2 g 0.031 lb 0.50 oz 16/32 oz 8/16 oz 5/10 oz 4/8 oz 2/4 oz	0.005 lb*
3		over 7 oz to 48 oz over 0.4375 lb to 3 lb	28.3 g 0.062 lb 1 oz	0.01 lb*
4		over 48 oz to 160 oz over 3 lb to 10 lb	42.5 g 0.094 lb 1.50 oz 1 16/32 oz 1 8/16 oz 1 5/10 oz 1 4/8 oz 1 2/4 oz	0.01 lb*
5		over 160 oz over 10 lb	1% of labeled weight	

* This scale division is recommended but not required.

PART V: PACKAGE ERRORS, RECORDING PACKAGE ERRORS, AND DETERMINING THE TOTAL PACKAGE ERROR

Package Errors and Recording Package Errors

In the meat and poultry industry, several methods of weighing packages are used to determine net weight. The most common method is to weigh unopened packages to determine their gross weight. Then subtract the average tare weight from their gross weight to obtain their actual net weight.

Actual package/container net weight = (gross weight) – (tare weight)

When the FSIS program employee performs a net weight check, the actual weight of the package or container, in most cases, will not be the same as the labeled weight. Positive or negative deviations from the labeled weight (referred to as plus or minus package errors), rather than the actual net weight, is the matter of interest to the FSIS program employee.

Package error = (actual package/container net weight) - (labeled weight)

A *positive* (plus) package error means that there is *more* product in the package or container than declared on the label. A *negative* (minus) package error means that there is *less* product than declared on the label.

When performing a net weight test, the FSIS program employee records the plus or minus package error as a dimensionless unit, rather than as a weight value in pounds, ounces, grams, etc., on FSIS Form 7240-1. To get a dimensionless unit, divide the *package error* by the unit of measure of the scale used for the net weight test.

Formula: Package error ÷ Scale division = Package error for the worksheet

Example: The FSIS program employee is using a scale calibrated in 1/16 oz graduations to perform the net weight check on a 16 oz product. The average tare weight is 1/16 oz. The first package weighed has a gross weight of 15 14/16 oz. Therefore:

15 14/16 oz	Gross weight
- 1/16 oz	Average tare weight
15 13/16 oz	Actual net weight
- 16 oz	Labeled weight
- 3/16 oz	Package error

Instead of recording a -3/16 oz FSIS Form 7240-1, the FSIS program employee would record a -3.

Calculation: $\frac{-3/16}{1/16} = \frac{-3}{1} = -3$

Another frequently used method of weighing packages automatically accounts for tare weight eliminating the need to subtract the average tare weight from the gross package weight. To do this on an equal arm scale requires placing the nominal gross weight (labeled weight plus the average tare weight) made up of standard test weights on one side at the scale. Then unopened sample packages are compared to the nominal gross weight *by placing them,* one at a time, on the other side of the scale.

As each package is weighed, the plus or minus package error can be read in dimensionless units directly from the scale tower face. Dividing the weight value by the unit of measure is unnecessary. Simply count the number of scale graduations and record this value on FSIS Form 7240-1, in the appropriate plus or minus column. For this method of weighing packages:

Package error = gross weight of the package - nominal gross weight

The circuitry of an electronic scale can automatically calculate the package errors. To prepare an electronic scale, place the nominal gross weight made up of standard test weights on the scale. Press the "zero" or "tare" to tare out the nominal gross weight. The reading will indicate directly how much each package is above or below the nominal gross weight. The package errors can be recorded in dimensionless units by simply disregarding the decimal point in the scale reading. Again:

Package error = gross weight of the package - nominal gross weight

NOTE: The actual unused tare or dry tare can only be used as part of the nominal gross weight in those situations where the tare weight does not vary excessively.

Sample problem for recording package or container errors.

The FSIS program employee has determined that the inspection lot consists of 32 boxes of bulk-packed beef egg rolls. Eight pounds is declared on the label of each box. The scale that will be used by the FSIS program employee to weigh the 10 randomly selected containers is calibrated in 0.01 lb graduations.

Actual Net Weights of the Sample Units 1-10

(1)	8.14 lb	(6)	7.98 lb
(2)	7.96 lb	(7)	8.10 lb
(3)	7.92 lb	(8)	8.06 lb
(4)	8.04 lb	(9)	7.94 lb
(5)	8.11 lb	(10)	7.93 lb

Units 1 through 10 recorded on FSIS Form 7240-1

STANDARD WEIGHTS (10 OR 30 SAMPLE SIZE)		
UNIT	+	-
1	**14**	
2		**4**
3		**8**
4	**4**	
5	**11**	
6		**2**
7	**10**	
8	**6**	
9		**6**
10		**7**
TOTAL +'s and –'s (10 weights)	**45**	**27**
TOTAL ERROR +'s and –'s		

Determining the Total Package

The total package error is the sum of the individual package errors comprising the sample.

To calculate the total package error:

1. Total the +'s and –'s. In the previous sample problem (page 24), we had +45 and -27.
2. Determine the total difference by adding the total + and - numbers calculated in step 1. For the previous sample problem, -27 would be added to +45 for a total of +18. The *total package error* for the 10 weights in the previous sample problem is +18.

   NOTE: At times the total package error may be negative or based on 30 weights instead of 10 weights.

Work the following problem:
Use the label weights and actual weights given.

The scale used by the FSIS program employee to weigh each container was calibrated in 0.01 lb graduations.

1. Record the package errors (+ or -) on FSIS Form 7240-1.
2. Determine the total package error.

Labeled Net Weight of the Sample Units 1-10	*Actual Net Weight of the Sample Units 1-10*
(1) 7.26 lb	(1) 7.32 lb
(2) 6.95 lb	(2) 6.91 lb
(3) 6.18 lb	(3) 6.19 lb
(4) 4.20 lb	(4) 4.20 lb
(5) 5.32 lb	(5) 5.30 lb
(6) 6.64 lb	(6) 6.65 lb
(7) 7.27 lb	(7) 7.26 lb
(8) 7.58 lb	(8) 7.55 lb
(9) 4.60 lb	(9) 4.63 lb
(10) 6.31 lb	(10) 6.36 lb

CATCH WEIGHTS (10 OR 30 SAMPLE SIZE)

UNIT	LABEL WEIGHT	ACTUAL WEIGHT	+	-
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL +'s and –'s (10 weights)				
TOTAL ERROR +'s and –'s				

ART VI: APPLYING THE DECISION CRITERIA—MAXIMUM ALLOWABLE VARIATION AND TOTAL PACKAGE ERROR

After each package or container in the sample (either 10 or 30, depending on the size of the inspection lot) is weighed, the decision criteria for compliance is applied. There are two possible actions that the FSIS program employee may take:

1. Pass the lot.

2. Fail the lot.

Pass the inspection lot if:

1. No individual minus package or container error is greater than the appropriate maximum allowable variation (MAV) ***and***

2. The total package error is equal to or greater than zero.

Fail the inspection lot if:

1. One or more individual package or container errors is greater than the appropriate maximum allowable variation (MAV) ***or***

2. The total package error is less than zero.

Explanation:

MAV Criterion--Compare the largest minus package error with the MAV. If it is greater than the MAV, the inspection lot fails. If it is not greater than the MAV, continue to the "Total Package Error Criterion."

Example: If the MAV is -16 and the largest minus package error is -17 or more, the lot fails.

Total Package Error Criterion--If the total package error is either zero or a plus number, the inspection lot passes. If the total package error is a minus number, the inspection lot fails.

Example: If the package errors are -1, 0, +2, -2, 0, -2, +3, -1, and -2, the total package error is -2. The lot fails.

Failed Lots

Any inspection lot tested and found not to comply with the net weight requirements may be reprocessed by the official establishment. As a minimum, each package or container must be reweighed and remarked to satisfy the net weight requirements. *Reprocessed lots must be reinspected prior to being released.*

PART VII: NET WEIGHT WORKSHEET EXAMPLES FOR EVALUATING THE NET WEIGHT TEST FOR COMPLIANCE

On the next two pages are two worksheet examples to illustrate the net weight compliance principles for meat and/or poultry products.

Example #1: In worksheet #1, there are 30 packages sampled because the inspection lot size of 2000 is greater than 250 (refer to Table 2-5, page 21).

The lot fails due to MAV criterion noncompliance. A single package has an error greater than the MAV. Sample unit 26 is -7. The MAV is -6. Since -7 is at least one negative unit greater than the MAV, the lot fails. No further testing is needed.

Example #1

NET WEIGHT WORKSHEET

DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (*Lower Limit*)
10/25/99	**00038—M**	**0.01 lb**	**0.03 lb**	**3**	**-6**

LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:		LABELED WEIGHT
2,000	**30**	**sliced bologna**	**sell-by 11-25-99**	**12 oz**

STANDARD WEIGHTS (10 or 30 sample size)

UNIT	+	-
1		1
2	2	
3	3	
4		1
5		1
6	5	
7	2	
8		6
9		1
10	3	
TOTAL +'S AND –'S (*10 weights*)		
TOTAL ERROR +'S AND –'S (*10 weights*)		
11	5	
12		1
13	3	
14		4
15		1
16	2	
17	3	
18		3
19		1
20	4	
21		2
22	2	
23		3
24	2	
25	4	
26		7
27		1
28		3
29	2	
30	4	
TOTAL +'S AND –'S (*30 weights*)	46	36
TOTAL ERROR +'S AND –'S (*30 weights*)	+10	

CATCH WEIGHTS (*10 or 30 sample size*)

UNIT	LABEL WEIGHT	ACTUAL WEIGHT	+	-
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL +'S AND –'S (*10 weights*)				
TOTAL ERROR +'S AND –'S (*10 weights*)				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL +'S AND –'S (*30 weights*)				
TOTAL ERROR +'S AND –'S (*30 weights*)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV?

☒ YES – Lot Fails ☐ NO – Check Total Error

TOTAL ERROR CRITERIA: Is any total error equal to or greater than zero?

☐ YES – Lot is Acceptable ☐ NO – Lot Fails

Example #2: In worksheet example #2, only 10 packages are sampled because the inspection lot size of 200 is less than 251 (refer to Table 2-5, page 21).

The lot passes because it complies with both the MAV and the total package error criteria. No minus package error is greater than the MAV value and the total package error is zero or a plus (positive) number.

Example #2

NET WEIGHT WORKSHEET

DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (*Lower Limit*)
10/29/99	**00042—P**	**0.01 lb**	**0.04 lb**	**3**	**-6**

LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:	LABELED WEIGHT
2,00	**10**	**Young Chickens**	**Random**

STANDARD WEIGHTS (10 or 30 sample size)

UNIT	+	-
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL +'S AND –'S (*10 weights*)		
TOTAL ERROR +'S AND –'S (*10 weights*)		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
TOTAL +'S AND –'S (*30 weights*)		
TOTAL ERROR **+'S AND –'S (*30 weights*)**		

CATCH WEIGHTS (*10 or 30 sample size*)

UNIT	LABEL WEIGHT	ACTUAL WEIGHT	+	-
1	2.52	2.57	5	
2	2.53	2.56	3	
3	2.98	2.97		1
4	2.65	2.59		6
5	2.43	2.42		1
6	2.91	2.91	0	
7	2.44	2.43		1
8	2.91	2.92	1	
9	2.96	2.96	0	
10	2.65	2.66	1	
TOTAL +'S AND –'S (*10 weights*)			10	9
TOTAL ERROR +'S AND –'S (*10 weights*)			+1	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL +'S AND –'S (*30 weights*)				
TOTAL ERROR +'S AND –'S (*30 weights*)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV?

☐ YES – Lot Fails ☒ NO – Check Total Error

TOTAL ERROR CRITERIA: Is any total error equal to or greater than zero?

☒ YES – Lot is Acceptable ☐ NO – Lot Fails

PART VIII: NET WEIGHT WORKSHOP PROBLEMS

Blank copies of the net weight worksheet are to be used for recording the results of the four problems in the workshop. Each worksheet is numbered and follows the corresponding problem. At the bottom of the worksheet, give the reason for the action you took for each problem. The table below may be used as a guide.

Action	*Number of Package Errors > MAV*		*Total Package or* Container Errors
Pass the lot if:	0	and	Equals or exceeds 0
Fail the lot if:	1 or more	or	Below 0

Problem 1

The inspection lot consists of 205 cases of smoked pork shoulder butts (Pack Date 1-2-92). Tare sample unit #1 weighed 5/8 oz and tare sample unit #2 weighed 6/8 oz.

Ten smoked butts have the following weights marked on them:

Marked Net Weight (oz)

(1) 30 5/8 oz
(2) 31 1/8 oz
(3) 32 oz
(4) 24 4/8 oz
(5) 26 1/8 oz
(6) 31 7/8 oz
(7) 30 6/8 oz
(8) 24 1/8 oz
(9) 29 2/8 oz
(10) 31 5/8 oz

These smoked butts, when weighed with a scale calibrated in 1/8 oz, weighed:

Actual Net Weight (oz)

(1) 30 6/8 oz
(2) 30 7/8 oz
(3) 32 2/8 oz
(4) 24 3/8 oz
(5) 26 3/8 oz
(6) 32 4/8 oz
(7) 29 3/8 oz
(8) 24 5/8 oz
(9) 29 4/8 oz
(10) 31 5/8 oz

PROBLEM # 1

NET WEIGHT WORKSHEET

DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (*Lower Limit*)
LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:			LABELED WEIGHT

STANDARD WEIGHTS (10 or 30 sample size)

UNIT	+	-
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL +'S AND –'S (*10 weights*)		
TOTAL ERROR +'S AND –'S (*10 weights*)		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
TOTAL +'S AND –'S (*30 weights*)		
TOTAL ERROR **+'S AND –'S (*30 weights*)**		

CATCH WEIGHTS (*10 or 30 sample size*)

UNIT	**LABEL WEIGHT**	ACTUAL WEIGHT	**+**	**-**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL +'S AND –'S (*10 weights*)				
TOTAL ERROR +'S AND –'S (*10 weights*)				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL +'S AND –'S (*30 weights*)				
TOTAL ERROR +'S AND –'S (*30 weights*)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV?

☐ YES – Lot Fails ☐ NO – Check Total Error

TOTAL ERROR CRITERIA: Is any total error equal to or greater than zero?

☐ YES – Lot is Acceptable ☐ NO – Lot Fails

Problem 2

The inspection lot is palletized and cased--375 cases arranged on 5 pallets, each holding 75 cases. Each case contains a dozen 15 ounce cans of beef and gravy (code BG G020 K). Tare sample unit #1 weighed 1 1/10 oz and tare sample unit #2 weighed 1 2/10 oz.

The 30 sample unit weights, scale calibrated in 1/10 oz graduations, are:

Actual Net Weights

(1) 15 oz	(11) 14 8/10 oz	(21) 15 oz
(2) 15 1/10 oz	(12) 15 oz	(22) 15 1/10 oz
(3) 15 2/10 oz	(13) 15 1/10 oz	(23) 15 2/10 oz
(4) 14 9/10 oz	(14) 15 oz	(24) 15 oz
(5) 14 9/10 oz	(15) 15 3/10 oz	(25) 15 oz
(6) 14 9/10 oz	(16) 14 7/10 oz	(26) 15 3/10 oz
(7) 15 oz	(17) 14 9/10 oz	(27) 14 8/10 oz
(8) 15 2/10 oz	(18) 15 1/10 oz	(28) 15 oz
(9) 15 1/10 oz	(19) 15 oz	(29) 15 2/10 oz
(10) 15 1/10 oz	(20) 15 1/10 oz	(30) 15 3/10 oz

PROBLEM # 2

NET WEIGHT WORKSHEET

DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (*Lower Limit*)
LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:			LABELED WEIGHT

STANDARD WEIGHTS (10 or 30 sample size)

UNIT	+	-
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL +'S AND –'S (*10 weights*)		
TOTAL ERROR +'S AND –'S (*10 weights*)		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
TOTAL +'S AND –'S (*30 weights*)		
TOTAL ERROR **+'S AND –'S (*30 weights*)**		

CATCH WEIGHTS (*10 or 30 sample size*)

UNIT	**LABEL WEIGHT**	ACTUAL WEIGHT	**+**	**-**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL +'S AND –'S (*10 weights*)				
TOTAL ERROR +'S AND –'S (*10 weights*)				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL +'S AND –'S (*30 weights*)				
TOTAL ERROR +'S AND –'S (*30 weights*)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV?

☐ YES – Lot Fails ☐ NO – Check Total Error

TOTAL ERROR CRITERIA: Is any total error equal to or greater than zero?

☐ YES – Lot is Acceptable ☐ NO – Lot Fails

FSIS FORM 7240-1 (7/91) REPLACES FSIS FORM 7240-1 (3/86), WHICH IS OBSOLETE

Problem 3

The inspection lot consists of 500 cases of mechanically deboned chicken (Pack Date: 1-2-96). Each container has 60 lb declared on the label. Tare sample unit #1 weighed 0.06 lb and tare sample #2 weighed 0.07 lb.

The 30 sample unit weights, electronic scale calibrated in 0.01 lb graduations, are: (Note: Nominal gross weight has been tared.)

Package Errors

(1) 0.04 lb	(11) -0.20 lb	(21) -0.01 lb
(2) -0.06 lb	(12) -0.08 lb	(22) -0.04 lb
(3) -0.44 lb	(13) -0.04 lb	(23) -0.10 lb
(4) 0.40 lb	(14) -0.05 lb	(24) 0.02 lb
(5) 0.70 lb	(15) 0.06 lb	(25) 0.00 lb
(6) -0.27 lb	(16) 0.01 lb	(26) -0.04 lb
(7) -0.05 lb	(17) 0.00 lb	(27) -0.12 lb
(8) 0.20 lb	(18) 0.20 lb	(28) 0.00 lb
(9) 0.15 lb	(19) -0.11 lb	(29) -0.24 lb
(10) 0.12 lb	(20) -0.07 lb	(30) -0.18 lb

PROBLEM # 3

NET WEIGHT WORKSHEET

DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (*Lower Limit*)
LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:			LABELED WEIGHT

STANDARD WEIGHTS (10 or 30 sample size)

UNIT	+	-
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL +'S AND –'S (*10 weights*)		
TOTAL ERROR +'S AND –'S (*10 weights*)		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
TOTAL +'S AND –'S (*30 weights*)		
TOTAL ERROR **+'S AND –'S (*30 weights*)**		

CATCH WEIGHTS (*10 or 30 sample size*)

UNIT	**LABEL WEIGHT**	ACTUAL WEIGHT	**+**	**-**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL +'S AND –'S (*10 weights*)				
TOTAL ERROR +'S AND –'S (*10 weights*)				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL +'S AND –'S (*30 weights*)				
TOTAL ERROR +'S AND –'S (*30 weights*)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV?

☐ YES – Lot Fails ☐ NO – Check Total Error

TOTAL ERROR CRITERIA: Is any total error equal to or greater than zero?

☐ YES – Lot is Acceptable ☐ NO – Lot Fails

FSIS FORM 7240-1 (7/91) REPLACES FSIS FORM 7240-1 (3/86), WHICH IS OBSOLETE

Problem 4

The inspection lot consists of 50 cases of beef tamales. Each case contains 60 individually wrapped and labeled beef tamales (code D0926). Each tamale has 3 oz (85 g) declared on the label. Tare sample unit #1 weighed 2.2 g and tare sample #2 weighed 2.3 g.

The 30 sample unit weights, scale calibrated in 0.1 g graduations, are:

Actual Net Weights

(1) 90.2 g	(11) 83.6 g	(21) 83.9 g
(2) 86.4 g	(12) 86.4 g	(22) 89.1 g
(3) 83.8 g	(13) 83.5 g	(23) 89.8 g
(4) 81.6 g	(14) 90.8 g	(24) 91.4 g
(5) 79.6 g	(15) 88.5 g	(25) 90.2 g
(6) 88.1 g	(16) 87.7 g	(26) 89.8 g
(7) 91.0 g	(17) 88.3 g	(27) 90.9 g
(8) 82.4 g	(18) 87.7 g	(28) 86.4 g
(9) 88.4 g	(19) 70.8 g	(29) 83.2 g
(10) 80.4 g	(20) 82.8 g	(30) 81.6 g

PROBLEM # 4

NET WEIGHT WORKSHEET

DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (*Lower Limit*)
LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:			LABELED WEIGHT

STANDARD WEIGHTS (10 or 30 sample size)

UNIT	+	-
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL +'S AND –'S (*10 weights*)		
TOTAL ERROR +'S AND –'S (*10 weights*)		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
TOTAL +'S AND –'S (*30 weights*)		
TOTAL ERROR **+'S AND –'S (*30 weights*)**		

CATCH WEIGHTS (*10 or 30 sample size*)

UNIT	**LABEL WEIGHT**	ACTUAL WEIGHT	**+**	**-**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL +'S AND –'S (*10 weights*)				
TOTAL ERROR +'S AND –'S (*10 weights*)				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL +'S AND –'S (*30 weights*)				
TOTAL ERROR +'S AND –'S (*30 weights*)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV?

☐ YES – Lot Fails ☐ NO – Check Total Error

TOTAL ERROR CRITERIA: Is any total error equal to or greater than zero?

☐ YES – Lot is Acceptable ☐ NO – Lot Fails

FSIS FORM 7240-1 (7/91) REPLACES FSIS FORM 7240-1 (3/86), WHICH IS OBSOLETE

SCRIPT 2

Net Weights--Quality Control Overview

Note: The section in FSIS Directive 7240.1 (Compliance Testing for Net Weight Labeling of Meat and Poultry Products, 12/20/91) that covers net weight quality control programs and systems (section VII and Attachments 1 and 2) has not been officially canceled. However, §318.4 and §381.145 essentially eliminate that command-and-control section of the Directive. For purposes of this training module, we will present the QCP/TQC portion as an on-line QC **model**. If an establishment is following FSIS Directive 7240.1, it is necessary for FSIS personnel to know what the symbols mean and to correctly interpret the charts.

If establishment management wants to do their own verification for net weight compliance, they may develop an effective quality control program or system. The only requirements for the program are that it shall include, as appropriate, detailed information on the:

- raw material control
- critical check or control points
- nature and frequency of tests to be made
- charts and records that will be used
- length of time such charts and records will be maintained in the custody of the official establishment
- limits which will be used and points at which corrective action will be taken to prevent recurrence of a loss of control
- nature of the corrective action – ranging from least to most severe

The establishment may include additional requirements as necessary to meet specific needs.

Also, the written program and data and information generated by the program must be made available to FSIS program employees. The program must ensure the product is in control and that applicable label limits are being met. Process control is determined by generally recognized statistical process control procedures.

When the establishment has a quality control program or system to verify net weight compliance, FSIS's responsibility does not cease. FSIS program employees will verify the program or system to assure that the establishment is following the program or system and is effectively controlling product.

The responsibilities and verifying procedures will be as follows:

1. FSIS program employees will review and evaluate establishment records as scheduled through PBIS to determine if they are on file, timely, accurate, complete, and indicate that the program or system is implemented and monitored by the establishment, including corrective and preventive actions when necessary. FSIS program employees will also check that the limits are consistent with the program's requirements.

2. FSIS program employees will verify the effectiveness of the quality control program or system as scheduled through PBIS by:

    a. Checking scales for a valid State certification seal or other acceptable certification.

b. Checking the accuracy of the scales.

c. Checking tare weights through random selection and weighing the number of empty containers specified in the approved quality program or system.

d. Performing a net weight/drained weight inspection, including sampling in the same manner as stated in the QC program or system, and using the same acceptance criteria.

e. Observing quality control personnel sampling and weighing and recording results.

3. Under a HACCP system, inspection personnel will document the non-compliance on FSIS Form 5400-4, Noncompliance Report (NR) and take any necessary official control actions.

Supplement 2

Part I	Symbols
Part II	Definitions
Part III	Limits
Part V	Plotting Results on a Control Chart

Resources

§318.4 and §381.145, Meat and Poultry Inspection Regulations
FSIS Directive 7240.1

PART 1. SYMBOLS

In quality control manuals, the symbols $\bar{x}$' = average and R = range.

From Table 3, Attachment 2, of FSIS Directive 7240.1 (page 48), the definitions for the following symbols are:

$\bar{X}'$ = marked or required weight

(LRL) = lower limit for individual weights

(LRL) X 10 = lower limit for subgroup averages of 10 weights

(LRL) X 5 = lower limit for subgroup averages of 5 weights

(R) 10 = limit for ranges of subgroups of 10 weights

(R) 5 = limit for ranges of subgroups of 5 weights

In quality control programs or systems, a subgroup size of 5, 10, or other number of units will be used; at no time would two different subgroup sizes be used simultaneously.

PART II. DEFINITIONS

Sample Unit. An individual package or container.

Subgroup. 5, 10, or other number of sample units.

Sample. The group of packages from the production lot that is selected to be tested. The sample may include subgroups and/or sample units.

Range. The difference between the largest and the smallest weight in a set of measured weights.

Run. The term used to describe consecutive high or low subgroup averages (above or below label weight).

Lot. A collection of identically labeled packages produced within a given period of time, e.g., a two-hour period within a production shift, half of a production shift, or an entire production shift.

From the preceding definitions, select the correct word or words and fill in the following blanks:

1. A package of bacon would be _____.

2. All the subgroups taken from a production line of identically labeled packages (Example: 25 subgroups of 5 sample units = 125 sample units) would be the _____.

3. Ten packages of bacon taken at one time from the production line would be a _____.

4. If 5 sample units of a 16-oz product weighed 16 1/16, 15 14/16, 16, 16 5/16, and 16 oz (which equates to +1, -2, 0, +5, and 0), 7 would be the _____.

5. Four consecutive subgroup averages below label weight but above the lower limit for the subgroup average would be a _____.

6. A shift's production of identically labeled packages would be a _____.

PART III. LIMITS

Table 3, Attachment 2 of FSIS Directive 7240.1 (page 48) is an example of the limits for a quality control program or system. The establishment may use these limits or design its own, provided they are equal to or more restrictive than those shown in the table. For this section of the supplement, the limits in Table 3 will be used.

We will use a scenario where quality control personnel are weighing a subgroup of a group 3--16-oz product every hour, using a scale calibrated in 1/16 oz.

Using Table 3, Attachment 2, list the limits for the following:

Lower limit for individual weights_____

Lower limit for subgroup averages of 5 weights, (LRL) X 5 _____

Limit for ranges of subgroups of 5 weights, (R) X 5 _____

PART IV: PLOTTING RESULTS ON A CONTROL CHART

Establishments often display net weight data graphically on control charts. Control charts put columns of data in picture form.

On page 47 is an example of a control chart for plotting subgroup averages and ranges. Each establishment will design a control chart to meet the requirements for FSIS and its specific needs.

The chart on the following page has an upper control limit (URL) for individual sample units and an upper control limit for the subgroup average (URL X 5). The upper control limits are not required by FSIS. Most establishments will have these limits on the control chart for their own need to control the overfilling of containers.

The control chart on page 47 in no way represents what is required; it is only used to show how data is recorded and control limits applied.

QC Workshop

Nine subgroups have been recorded (using the + and - method) on page 46 and the results plotted for you to use as a guide on page 47. Compare individual weights, subgroup averages, and the average of all the subgroups on the net record and control chart (pages 46 and 47) to the LRL limit, LRL X 5 limit, and R X 5 limit. Indicate at the bottom of the control chart if individual, average, or range limits have been exceeded.

LINE 1 **SHIFT 1**
CODE 001
SCALE 1/16 OZ
NET WEIGHT 16 OZ
TARGET WEIGHT 16 2/16 OZ
GROUP 3 **(LRL) 15 OZ** **(LRL) X 5 15 8/16 OZ** **(R) 5 1 4/16 OZ**
PRODUCT _____

Time	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00
1	**+1**	**+5**	**+6**	**+3**	**+1**	**0**	**-6**	**-1**	**0**
2	**+4**	**-1**	**+3**	**+4**	**+2**	**+1**	**-2**	**-1**	**+2**
3	**0**	**+3**	**+5**	**+2**	**0**	**-1**	**-6**	**0**	**+3**
4	**+3**	**+4**	**+6**	**0**	**0**	**0**	**-4**	**+1**	**0**
5	**+2**	**+6**	**+6**	**0**	**+1**	**0**	**-6**	**+1**	**+4**
Total	**+10**	**+17**	**+25**	**+9**	**+4**	**0**	**-24**	**0**	**+9**
Avg.	**16 2/16**	**16 3/16**	**16 5/16**	**16 2/16**	**16 1/16**	**16**	**15 11/16**	**16**	**16 2/16**

16 2/16 = +2
16 3/16 = +3
16 5/16 = +5
16 2/16 = +2
16 1/16 = +1
16 = 0
15 11/16 = -5
16 = 0
16 2/16 = +2
10

10 ÷ 9 (number of subgroups) = 1.111, round to 1

Average of all the subgroups = 16 1/16

AVERAGE

(URL) 17 OZ

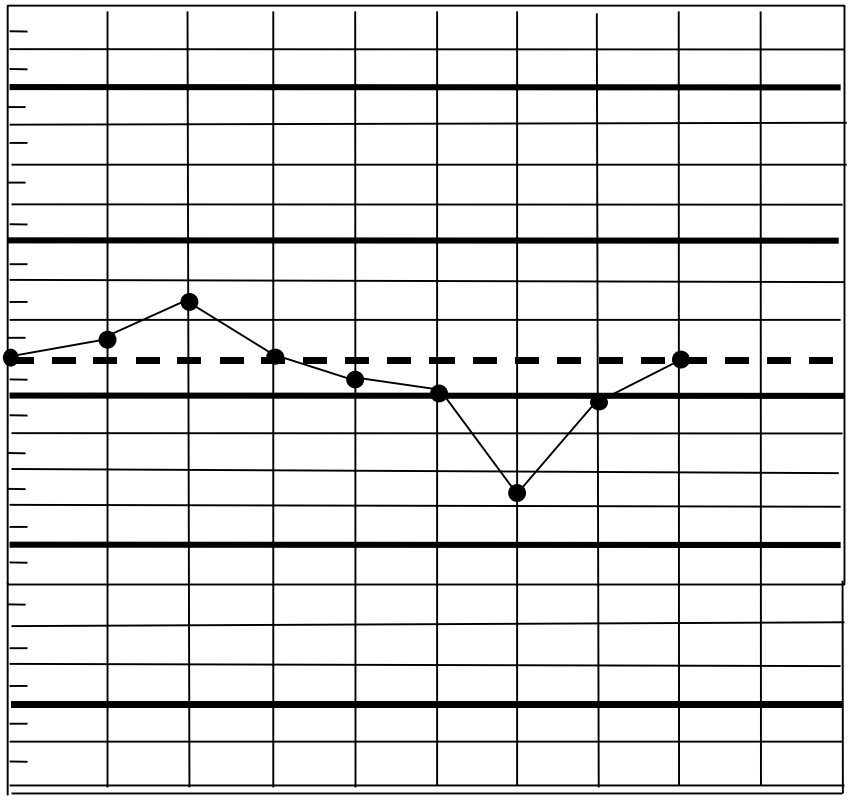
(URL) $\bar{X}_5$ 16 8/16

TARGET 16 2/16

$\bar{X}'$ 16 0Z

(LRL) $\bar{X}_5$ 15 8/16

(LRL) 15 0Z



2 OZ

R_5 1 0Z

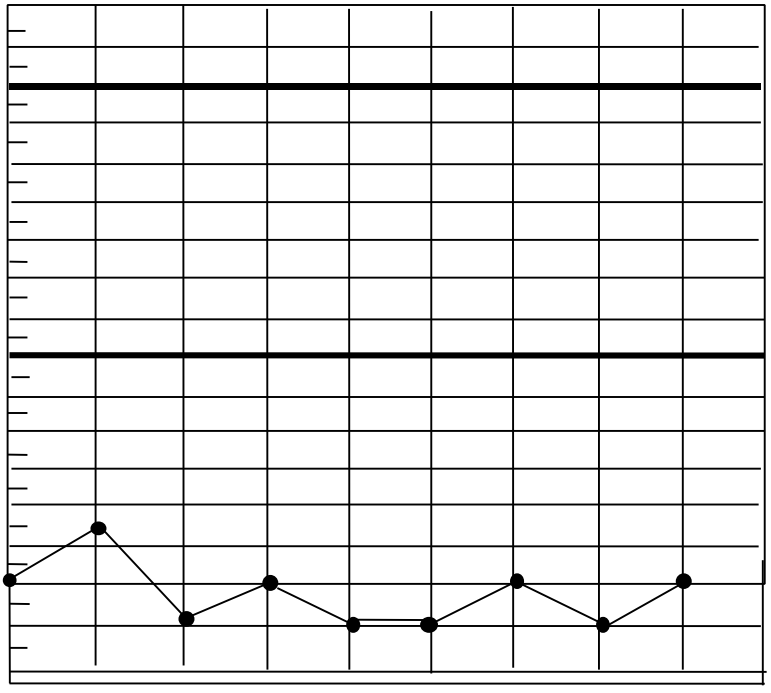


Table 3. Minimum and maximum limits [1/] for QC inspection

Standard deviation			.08 oz.	.16 oz.	.33 0z.	.50 oz.
$\bar{X}$' = Marked or required net weight		Group A	Group 1	Group 2	Group 3	Group 4
Lower limit for individual weights (LRL)	$\bar{X}$' minus	10% of $\bar{X}$'	7.1 gm. .25 oz. 8/32 oz. 4/16 oz. 2/10 oz. 2/8 oz. ¼ oz.	14.2 gm. .50 oz. 16/32 oz. 8/16 oz. 5/10 oz. 4/8 oz. 2/4 oz.	28.3 gm. 1 oz. 1 oz. 1 oz. 1 oz. 1 oz. 1 oz.	42.5 gm. 1.50 oz. 1 16/32 oz. 1 8/16 oz. 1 5/10 oz. 1 4/8 oz. 1 2/4 oz.
Lower limit for subgroup averages for 10 weights (LRL-) X 10	$\bar{\bar{X}}$' minus	3% of $\bar{X}$'	2.2 gm. 0.08 oz. 2/32 oz. 1/16 oz. (2/) (2/) (2/)	4.5 gm. .16 oz. 5/32 oz. 2/16 oz. 1/10 oz. 1/8 oz. (2/)	9.1 gm. .32 oz. 10/32 oz. 5/16 oz. 3/10 oz. 2/8 oz. ¼ oz.	13.6 gm. .48 oz. 15/32 oz. 7/16 oz. 4/10 oz. 3/8 oz. ¼ oz.
Lower limit for subgroup averages of 5 weights (LRL-) X 5	$\bar{X}$' minus	4% of $\bar{X}$'	3.5 gm. .12 oz. 4/32 0z. 2/16 oz. 1/10 oz. 1/8 oz. (2/)	7.0 gm. .25 oz. 8/32 oz. 4/16 oz. 2/10 oz. 2/8 oz. ¼ oz.	14.1 gm. .50 oz. 16/32 oz. 8/16 oz. 5/10 oz. 4/8 oz. 2/4 oz.	21.2 gm. .75 oz. 24/32 oz. 12/16 oz. 7/10 oz. 6/8 oz. ¾ oz.
Limit for ranges of subgroups of 10 weights $(R)_{10}$		15% of $\bar{X}$'	10.8 gm. .38 oz. 12/32 oz. 6/16 oz. 3/10 oz. 3/8 oz. ¼ oz.	21.5 gm. .76 oz. 24/32 oz. 12/16 oz. 7/10 oz. 6/8 oz. ¾ oz.	43.4 gm. 1.53 oz. 1 17/32 oz. 1 8/16 oz. 1 5/10 oz. 1 4/8 oz. 1 2/4 oz.	64.9 gm. 2.29 oz. 2 9/32 oz. 2 4/16 oz. 2 2/10 oz. 2 2/8 oz. 2 ¼ oz.
Limit of ranges of subgroups of 5 weights $(R)_5$		12% of $\bar{X}$'	9.1 gm. .32 oz. 10/32 oz. 5/16 oz. 3/10 oz. 2/8 oz. ¼ oz.	18.4 gm. .65 oz. 20/32 oz. 10/16 oz. 6/10 oz. 5/8 oz. 2/4 oz.	36.8 gm. 1.30 oz. 1 9/32 oz. 1 4/16 oz. 1 3/10 oz. 1 2/8 oz. 1 ¼ oz.	55.0 gm. 1.94 oz. 1 30/32 oz. 1 15/16 oz. 1 9/10 oz. 1 7/8 oz. 1 ¾ oz.

1/ Use limits recorded in terms of scale calibrations used. Ex: If scale is in 1/16ths, use limits in 1/16ths; if in grams use gram limits. Do not convert.

2/ Minimum limit is the marked or required net weight when sensitivity of scales used does not permit calibrations as precise as those recorded above.

Note: For group 5 products LRL is 1% of labeled weight
LRL_{10} is 0.04 lb.
LRL_5 is 0.06 lb.

Glossary

Average. The sum of individual measurement values divided by the number of individual measurements.

Average tare weight. The sum of the tare weights of individual package containers (including wrappers, etc.) divided by the number of containers weighed.

Decision criteria. The rules for determining whether or not an inspection lot is in conformance with package requirements based on the results of checking the packages in the sample.

Drained weight. The weight of solid or semisolid product representing the contents of a package obtained after a prescribed method for removal of the liquid has been completed.

Gross package weight. The weight of the entire package or container, including the product, packing material, soaker pads, and labels, etc.

Inspection lot. A collection of identically labeled and coded packages (except for the actual net weight in the case of random weight packages) from the same production shift available for inspection at one time.

Labeled weight. The net weight declared on the label.

Lower Limits for Individual Weights (LRL). The lower limit for individual measurements. The lowest value and individual measurement may have without causing the production lot to be retained for failure to meet prescribed requirements for individual measurements.

Lower Limit for Subgroup Averages (LRL X 5, 10, or other number). The lower limit for subgroup averages or means. The lowest value the average or mean of subgroup may have without causing the production to be retained for failure to meet prescribed requirements for subgroup averages.

Maximum allowable variation (MAV). The maximum shortage or underweight for an individual package that is considered “reasonable” in good manufacturing processes.

Net weight. The weight of packaged product remaining after deductions for tare weight have been made.

Nominal gross weight. The average tare weight plus the declared or labeled weight. It is considered to be what the “perfect” package (net contents plus packaging materials) would weigh.

Package error. The actual net weight of any package (or container) minus the labeled weight.

Production lot. The total collection of packages coded identically by the packer, usually consisting of those packages produced within a given unit of time (such as one production shift).

Production shift. The length of time the establishment works the same employees, e.g., 6:00 a.m. to 2:30 p.m., 6:00 a.m. to 6:00 p.m.

Random (catch) weight package. A package that is one of a lot, of the same product that do not have identical net content declarations.

Range (R). The difference between the largest and the smallest of a set of measured weights.

R (5) or R (10). The maximum range of either five or ten packages.

Run. The term used to describe consecutive high or low subgroup averages (above or below label weight).

Run criteria. Action to take when consecutive low subgroup averages occur.

Sample. The group of packages from the inspection lot/production lot that are selected to be tested.

Sampling plan. A specific plan that states the number of packages to be weighed and the associated decision criteria.

Sample unit. An individual package or container.

Standard weight package. A package that is one of a lot, shipment, or delivery of packages of the same commodity with identical net content declarations.

Subgroup. Either 5, 10 or other number of packages representing a subgroup.

Tare sample. The packages or packaging material use to determine the average tare weight.

Tare weight. The weight of a container, box, wrapper, or other packaging material or packing media that is not the product.

Total package error. The sum of the individual package errors comprising the sample.

Unit of measure. The smallest scale graduation on a mechanical scale or smallest denomination on electronic scale.

Unused tare weight. The weight of all packaging or container materials, e.g., soaker pads, labels, bags, interior wrappings, weighed before the product is introduced in to the container.

Ounces	Pounds	Grams
1 oz		28.35 grams
2 oz		58.70 grams
3 oz		85.05 grams
4 oz		113.40 grams
5 oz		141.75 grams
6 oz		170.10 grams
7 oz		198.45 grams
8 oz	0.50 lb	228.80 grams
12 oz	0.75 lb	340.20 grams
16 oz	1.00 lb	453.60 grams
18 oz		510.30 grams
32 oz	2.00 lb	907.20 grams
48 oz	3.00 lb	1360.80 grams
64 oz	4.00 lb	1814.40 grams
80 oz	5.00 lb	2268.00 grams
160 oz	10.00 lb	4536.00 grams